

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of)
)
Inquiry Regarding Carrier Current Systems,) ET Docket No. 03-104
including Broadband over Power Line Systems)
)
)

To: The Commission

I. INTRODUCTION

1. I present these comments as an individual, not representing my employer nor any other organization or company. As an avid amateur radio operator, I have focused on the issues that I believe PLC will raise for my amateur radio activities, and on my views regarding the technology itself.

II. INTERFERENCE TO AMATEUR RADIO

2. Over and over again, the threat that PLC poses to licensed amateur radio operations has been shown by theoretical modeling, tests and demonstrations. The emissions levels already permitted under Part 15 rules will cause huge increases in the noise floor across the amateur HF bands. Power wiring located feet from antennas and inches from station equipment will produce field strengths that will obliterate the weak signals we communicate with. The radiated signals from thousands of PLC-connected homes will propagate for hundreds of miles. Likewise, amateur transmissions will interfere with PLC systems.

3. In their report of March 3, 2003 to the Commission, the UPLC makes the claim that they have tested PLC in several areas, and that "None of these field trials have caused any interference to home entertainment equipment, licensed wireless services or other spectrum users." However, the power companies involved in the tests appear to have gone to some lengths to keep them out of public view, by not providing details about how, when or most critically where they would take place. Could this be because they know that amateur radio operations will be disrupted by the PLC trials?

III. RESOLUTION OF HARMFUL INTERFERENCE

4. A recurring theme in the lives of amateur radio operators, particularly those of us active on HF, is the problem of power line interference. The ARRL has documented hundreds of cases of RFI from cracked insulators, badly maintained equipment, and household devices that introduce conducted RFI into the power system. Frequently these interference sources are extremely hard to find, requiring extensive measurement, direction finding and testing to identify and locate. And

unfortunately many power companies have less than stellar records of responding to amateur complaints of interference, sometimes requiring FCC intervention before they will take the complaints seriously. Introduction of PLC is likely to make this problem worse in three ways.

5. All PLC systems share a common problem, the unsuitability of the power transmission infrastructure to data transmission. The PLC literature is particularly full of studies of the unpredictable and varying characteristics of home power wiring. The transfer characteristic of the home wiring changes as appliances, motors and even light switches are turned on and off, and at the same time the radiation characteristics change. The simple act of switching on the lights in a room could cause a PLC system to begin interfering with a licensed operation. Such variability will make it nearly impossible to identify the source of harmful interference.

6. Another difficulty shared by all the proposed PLC implementations is the distribution transformer's designed-in ability to filter frequencies above 60 Hz. This leads some PLC designs to install passive bridges to bypass the transformer, coupling the PLC signals into and out of the low-voltage distribution wiring. Of course, these bridges will also couple RFI into and out of the low-voltage system, with the potential of dramatically increasing the impact of existing RFI sources. This problem does not even require that PLC be in use in an area, only that the bridges are installed on the distribution transformers.

7. Finally, too many amateur operators are already familiar with the negative reactions that occur when poorly made or faulty consumer electronics interfere with, or worse still receive interference from their licensed operations. Many a ham has incurred the ire of their neighbors as a result. How will a neighbor react if I have to tell them that their brand-new PLC broadband service must be discontinued because it interferes with my station? How will they deal with not being able to surf the web when I'm operating, because their PLC modem cannot handle the field strengths generated by my transmitter? I doubt very much that they will take any comfort from a reading of the relevant sections of Parts 15 and 97. If PLC is as widely deployed as the power companies claim it will be, hundreds of thousands of amateurs will face this issue.

IV. INTERACTION BETWEEN LICENSED AND UNLICENSED USERS

8. The powerline networking industry has already indicated, in comments to another amateur radio related FCC action (ET Docket 02-98), that it believes itself to be at least as important as the amateur radio service. The HomePlug Powerline Alliance asserts that they "took the extra measure of notching out all current Amateur Radio bands between 4 and 21 MHz in order to minimize radiation in those bands." Of course the reality is that if HPPA had not taken such steps, their products would have caused widespread harmful interference to amateur operations and would have been unmarketable.

9. In their comments to the same proceeding, United PowerLine Council suggests that in addition to considering licensed users of RF spectrum, the Commission "needs to account for the potential impact on Broadband PLC products and services" - this despite the fact that PLC is unlicensed. They further suggest that it is necessary to reach

an accomodation between amateur (licensed) and PLC (unlicensed) operations, focusing at that time on the proposed 5 MHz amateur allocation but obviously intending that such accomodations would apply more generally. They also propose restrictions on licensed operations to avoid interference with unlicensed PLC systems.

V. IMPACT ON HOMELAND SECURITY

10. The power industry frequently references the benefits to homeland security of having yet another means of broadband communication, a theme repeated in several of the commissioners' comments to the Notice. It is certainly the case that multiple independent means of communications are critical to homeland security. Unfortunately PLC is not the best choice in this instance.

11. At present there are three widely deployed broadband network systems in the United States: DSL over phone lines, cable broadband over the cable television infrastructure, and direct broadcast satellite. The first two already share considerable physical infrastructure for their distribution and connections to homes, and indeed if one fails during a natural disaster the other often goes with it. An alternative communications infrastructure would be most desirable, but given that power lines share exactly the same physical infrastructure, PLC is certainly not an alternative in this instance. In fact, during weather or other natural emergencies power often fails when telephone and cable TV (and data) services are still available. The old saw about placing all one's eggs in a single basket is particularly applicable here.

12. As a radio amateur I am keenly aware of the need for reliable communications. I have redundancy in my household for telephones (land line and cellular telephones), data (cable modem and dialup) and most importantly power (commercial-grade uninterruptable power supplies and a backup generator). Most importantly, I maintain multiple redundant amateur radio stations, capable of being powered by batteries, taken mobile, and in general used whenever and wherever needed. If PLC were installed in my neighborhood some of those stations would likely have their utility reduced or even eliminated. Knowing that in a power failure the interference from PLC would also go away is small comfort.

VI. THE FUTURE OF BANDWIDTH

13. As a network engineer I have substantial experience with high bandwidth applications. I consider my home cable modem sufficient for some uses, but hardly a high-speed connection. In my work I often generate single data streams of 15 to 30 megabits per second (Mbps), an order of magnitude higher than cable can handle. It is not reasonable to expect that such applications would work over a home connection at this time, but I certainly hope that they will in the not too distant future. Many industry commentators share the view that even 10 Mbps is not sufficiently broad to meet the needs of broadband networking in the near term. California's recent One Gigabit or Bust initiative certainly underscores that point.

14. To the best of my knowledge no PLC system expects to deliver more than 3 Mbps to the home. This limitation is due to the fundamental

unsuitability of power lines for data transmission, and cannot be worked around. Cable modem and DSL systems are similarly limited, and though cable could expand beyond its current capabilities with additional infrastructure it is unlikely to ever reach even 100 Mbps to the home. Given the pace of growth of Internet traffic and application bandwidth demands, deploying PLC, a brand-new broadband system requiring all new data infrastructure, makes no sense.

VII. RECOMMENDATIONS

15. I strongly favor tightening the Part 15 rules to reduce the acceptable emissions limits for PLC systems, recognizing that the rules were written to apply to a radically different set of RF sources. If that is not possible, then maintaining the existing Part 15 rules as they stand will at least allow licensed spectrum users some recourse in resolving harmful interference.

16. If the Commission chooses to change the rules regarding PLC, particularly if the the permitted emission levels are raised beyond the current limits, I would suggest several palliative measures in an attempt to limit the damage to amateur operations.

17. Given the risk to licensed users, the claimed large market and the immature development state of PLC equipment, all manufacturers of Access and especially In-House devices should be required to comply with the Certification process, rather than Verification.

18. Manufacturers of PLC equipment should be required to implement spectral masks that reduce or eliminate emissions in the amateur bands, similar to what the HomePlug system already includes.

19. Testing of PLC equipment, particularly In-House systems, should be done in the most realistic conditions possible. In particular, use of estimating techniques should not be a substitute for actual field strength measurements.

20. I am convinced that few, if any amateur radio operators will choose to subscribe to PLC service. However, if PLC is installed in a neighborhood, the signals will infiltrate my house through the low-voltage power system. If passive bridges are installed on the distribution transformers, this will occur even if there are no subscribers served by a given transformer. To reduce this problem, power companies wishing to deploy PLC should be required, upon request and at their expense, to install low-pass filters that block all PLC signals at the pole and prevent them from traversing the feeder wires and reaching the house.

Sincerely,

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